DETAILED ACTION

EXAMINER'S AMENDMENT

1.   An examiner's amendment to the record appears below. Should the changes

and/or additions be unacceptable to applicant, an amendment may be filed as provided

by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be

submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview

with Nathaniel T. Wallace, Reg. No. 48909 on 09/22/2009.

The application has been amended as follows:

Claim 1 has been canceled.

Claim 2, (Currently Amended) The computer-implemented method of claim 1 25,

further comprising protecting data delivery by link error recovery.

Claim 4, (Currently Amended) The computer-implemented method of claim 1 25,

further comprising scaling the overlay spanning tree to an arbitrary group size.

Claim 7, (Currently Amended) The computer-implemented method of claim 1 25,

further comprising joining a new node to the spanning tree.

Claim 10, (Currently Amended) The computer-implemented method of claim 1

25, further comprising redetermining the spanning tree upon determining that an

existing node has left the spanning tree.

Claim 12, (Currently Amended) A program storage device readable by machine,

embodying a program of instructions executable executed by the machine a processor

to perform method steps for group communication over a network of processors, the method steps comprising: determining an overlay spanning tree comprising an origin node and at least one receiving node; determining a configuration of the overlay spanning tree having a maximum throughput among all possible configurations of the overlay spanning tree, wherein determining the configuration of the overlay spanning tree comprises defining a target bandwidth ~~less than~~ <u>having a value equal to half a sum of a minimum link bandwidth and</u> a maximum link bandwidth of edges of the overlay spanning tree given a fully connected overlay distribution graph, constructing a reduced overlay distribution graph having a minimum available bandwidth greater than the target bandwidth by iteratively removing an edge from a current overlay distribution graph, beginning with the fully connected overlay distribution graph, the edge having a bandwidth less than or equal to the target bandwidth, increasing the target bandwidth upon determining that the configuration of the overlay spanning tree is constructible based on the current overlay distribution graph, and decreasing the target bandwidth upon determining that the configuration of the overlay spanning tree is not constructible based on the current overlay distribution graph, until the configuration of the overlay spanning tree has the maximum throughput with no edge having a bandwidth below the target bandwidth; and controlling a source communication rate between the origin node and the at least one receiving node to be less than or equal to a bottleneck rate of the configuration of the overlay spanning tree based on the reduced overlay distribution graph.

Claim 13, (Currently Amended) The ~~method~~ program storage device of claim 12, further comprising protecting data delivery by link error recovery.

Claim 14, (Currently Amended) The ~~method~~ program storage device of claim 13, wherein the overlay spanning tree comprises a plurality of nodes, wherein the data delivery is reliable such that each node receives the same data.

Claim 15, (Currently Amended) The ~~method~~ program storage device of claim 12, further comprising scaling the overlay spanning tree to an arbitrary group size.

Claim 18, (Currently Amended) The ~~method~~ program storage device of claim 12, further comprising joining a new node to the spanning tree.

Claim 19, (Currently Amended) The ~~method~~ program storage device of claim 18, comprising joining the new node to an existing node of the spanning tree upon determining that the existing node has a bandwidth of greater than or equal to an existing rate.

Claim 20, (Currently Amended) The ~~method~~ program storage device of claim 19, further comprising: determining a triangular improvement upon determining that no existing node has a bandwidth greater than or equal to the existing rate; joining the new node at an attachment point having a highest bandwidth among existing nodes of the spanning tree upon determining that the triangular improvement failed; and redetermining the spanning tree upon determining bandwidth less than or equal to a minimum threshold.

Claim 21, (Currently Amended) The ~~method~~ program storage device of claim 12, further comprising redetermining the spanning tree upon determining that an existing node has left the spanning tree.

Claim 22, (Currently Amended) The ~~method~~ program storage device of claim 21, further comprising: determining orphaned child nodes of the existing node that has left the spanning tree; and performing a join for each orphaned child node.

Claim 24, (Currently Amended) The computer-implemented method of claim ~~4~~ 25, wherein the removed edge is not replaced in the current overlay distribution graph.

Claim 25, (Currently Amended) A computer-implemented method for group communication over a network of processors comprising: a computer system to implement the steps of: determining an overlay spanning tree comprising an origin node and at least one receiving node; determining a configuration of the overlay spanning tree having a maximum throughput among all possible configurations of the overlay spanning tree, wherein determining the configuration of the overlay spanning tree comprises defining a target bandwidth having a value equal to half a sum of a minimum link bandwidth and a maximum link bandwidth of edges of the overlay spanning tree given a fully connected overlay distribution graph, constructing a reduced overlay distribution graph having a minimum available bandwidth greater than the target bandwidth by iteratively removing an edge from a current overlay distribution graph, beginning with the fully connected overlay distribution graph, the edge having a bandwidth less than or equal to the target bandwidth, increasing the target bandwidth upon determining that the configuration of the overlay spanning tree is constructible

based on the current overlay distribution graph, and decreasing the target bandwidth upon determining that the configuration of the overlay spanning tree is not constructible based on the current overlay distribution graph, until the configuration of the overlay spanning tree has the maximum throughput with no edge having a bandwidth below the target bandwidth; and controlling a source communication rate between the origin node and the at least one receiving node to be less than or equal to a bottleneck rate of the configuration of the overlay spanning tree based on the reduced overlay distribution graph.

Reason for Allowance

2.   The following is an examiner's statement of reasons for allowance: Claims 2-4, 7-15, 18-22 and 24-25 are allowed.

The present invention is directed to method comprises determining a maximum throughput of the spanning tree among all possible configurations of the spanning tree given a reduced overlay distribution tree. Determining the overlay spanning tree comprises defining a target bandwidth having a value equal to half a sum of a minimum link bandwidth and a maximum link bandwidth of edges of the overlay spanning tree given a fully connected overlay distribution graph, constructing a reduced overlay distribution graph by removing an edge from the fully connected overlay distribution graph having a bandwidth less than or equal to the target bandwidth.

Regarding claim 12, a program storage device embodying a program of instructions executed by a processor to perform method steps for group communication

over a network of processors, the method steps comprising: determining an overlay spanning tree comprising an origin node and at least one receiving node; determining a configuration of the overlay spanning tree having a maximum throughput among all possible configurations of the overlay spanning tree, wherein determining the configuration of the overlay spanning tree comprises defining a target bandwidth having a value equal to half a sum of a minimum link bandwidth and a maximum link bandwidth of edges of the overlay spanning tree given a fully connected overlay distribution graph, constructing a reduced overlay distribution graph having a minimum available bandwidth greater than the target bandwidth by iteratively removing an edge from a current overlay distribution graph, beginning with the fully connected overlay distribution graph, the edge having a bandwidth less than or equal to the target bandwidth, increasing the target bandwidth upon determining that the configuration of the overlay spanning tree is constructible based on the current overlay distribution graph, and decreasing the target bandwidth upon determining that the configuration of the overlay spanning tree is not constructible based on the current overlay distribution graph, until the configuration of the overlay spanning tree has the maximum throughput with no edge having a bandwidth below the target bandwidth; and controlling a source communication rate between the origin node and the at least one receiving node to be less than or equal to a bottleneck rate of the configuration of the overlay spanning tree based on the reduced overlay distribution graph.

Regarding claim 25, a computer-implemented method for group communication over a network of processors comprising: a computer system to implement the steps of:

determining an overlay spanning tree comprising an origin node and at least one

receiving node; determining a configuration of the overlay spanning tree having a

maximum throughput among all possible configurations of the overlay spanning tree,

wherein determining the configuration of the overlay spanning tree comprises defining a

target bandwidth having a value equal to half a sum of a minimum link bandwidth and a

maximum link bandwidth of edges of the overlay spanning tree given a fully connected

overlay distribution graph, constructing a reduced overlay distribution graph having a

minimum available bandwidth greater than the target bandwidth by iteratively removing

an edge from a current overlay distribution graph, beginning with the fully connected

overlay distribution graph, the edge having a bandwidth less than or equal to the target

bandwidth, increasing the target bandwidth upon determining that the configuration of

the overlay spanning tree is constructible based on the current overlay distribution

graph, and decreasing the target bandwidth upon determining that the configuration of

the overlay spanning tree is not constructible based on the current overlay distribution

graph, until the configuration of the overlay spanning tree has the maximum throughput

with no edge having a bandwidth below the target bandwidth; and controlling a source

communication rate between the origin node and the at least one receiving node to be

less than or equal to a bottleneck rate of the configuration of the overlay spanning tree

based on the reduced overlay distribution graph.

        The closet prior art Silton et al (US 6,327,252 B1) discloses distributed computer

or server networks and to methods of automatically establishing communication links

between individual servers in the network. By taking advantage of the properties of

group addresses inherent in certain networking technologies, coupled with innovative discovery and hunt protocols the servers in the network all become members of an overlay spanning tree where the tree is comprised of servers as nodes and communication links as edges. Discovery and hunt protocols are implemented to locate peer servers in the network and communication links are set up as required.

Claims 2-4, 7-11, 24 and 13-15, 18-22 are allowed since they depend on claim 25 and 12 respectively.

3.   Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

4.   The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US 7,075,892 B2 (Gover et al.).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SYED BOKHARI whose telephone number is (571)270-3115. The examiner can normally be reached on Monday through Friday 8:00-17:00 Hrs..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kwang B. Yao can be reached on (571) 272-3182. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Syed Bokhari/
Examiner, Art Unit 2416
9/23/2009

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